Developing Properties

Introduction

Our activities associated with property development and redevelopment pose many potential environmental impacts and health & safety risks. In Hong Kong, these risks and impacts are acute, given limited land resources and the necessity to develop or redevelop in a densely populated urban environment.

Integrating environmental protection and health & safety control measures into all stages of our property development activities is extremely important, not only in terms of mitigating potential impacts today, but also for sustainable development. This is embodied in our philosophy of 'Building Communities', which involves addressing environmental concerns throughout the property life cycle. We are similarly committed to our principle of 'Building Exceptional Value'. To achieve this, we research ideas, innovate and create new development projects using advanced technology and environmental designs that are built to the highest standards.

Our Approach to EHS

Our property development activities can be simplified into five core activity areas:

Site Acquisition, which includes:
- Site appraisal
- Site selection
- Site acquisition

Development Planning, which includes:
- Development appraisal
- Town Planning and Lands approvals
- Concept design

Design and Contract Documentation, which includes:
- Schematic and detailed design
- Contract drawings and specifications
- Tendering and contract award

Construction, which includes:
- Demolition
- Site investigation
- Site formation and foundations works
- Superstructure and interiors
- Landscaping

Disposal of the Development by Sales (Trading) or Retention of the Development for Management (Investment)

Location and land use are important factors that determine the extent and nature of potential environmental impacts and the health & safety risks of a development. Therefore we ensure that all development locations are carefully considered before final site selection.

We focus our developments in already developed areas with existing facilities, utilities and public transport interchanges, often redeveloping previously used 'brown-field sites'. This minimises encroachment on Hong Kong's scarce and ecologically valuable resources and avoids contributing to further traffic congestion and the associated pollution and disturbance.

The development of the Island East Complex began in 1975. Originally the site of the Taikoo Sugar Refinery and later the Taikoo Dockyard, the area has been revitalised and now serves the local community as an integrated complex of offices, retail, leisure amenities and residential property, connected to the Quarry Bay and Taikoo MTR stations.

We revitalise and contribute to the local economy, community and environment through providing mixed-use developments with a balance of business, commerce, recreation, education and residential facilities, whilst creating a pleasant environment in which people visit, live, work and recreate.

Following site acquisition and development planning, we focus on design and construction methods to minimise potential EHS impacts. Our external consultant teams are carefully selected for their relevant technical experience and expertise and their awareness of our five corporate values. In addition to addressing quality and the requisite functional requirements, these teams address EHS issues at every stage in the development process. Our design guidelines and contract requirements provide direction in EHS issues for our building and engineering systems.

In particular, we pride ourselves on reaching beyond industry norms when designing and constructing our projects. Legislative compliance is therefore an absolute minimum requirement; standards and government safety requirements are met or exceeded in all cases. Through our works contracts, we specifically mandate all our consultants and contractors to comply with specific EHS requirements as a prerequisite for doing business with us.

Environmental Protection

Development Planning, Design and Contract Documentation

Environmental issues such as good urban design, energy efficiency, natural resource use, indoor environmental quality, reduced noise, air and water impacts, minimising waste, etc., are key considerations in the planning, design and specification of our buildings. Through our design work, we aim to reduce environmental impacts and to create a pleasant community.

We assess both financial and environmental aspects in making decisions on building design. Sometimes environmental measures are adopted at extra cost when the environmental benefits are considered to be significant. Often selected environmental features can effectively reduce costs e.g. energy saving equipment, façade treatment or re-use of building finishes.

Architectural and Landscape Design

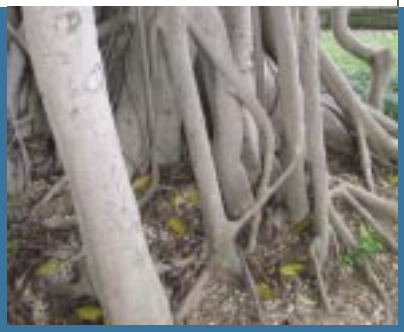
Through the architectural design of our buildings we strive to conserve energy, as well as reduce noise and enhance the local environment by carefully considering building size, shape and orientation.

Using natural vegetation and landscaping, we create a 'microclimate' around our buildings to harness natural cooling, lighting and ventilation. We integrate pedestrian areas with public transport links, develop pedestrian corridors and create open spaces for a more pleasing urban environment.

As an example, Taikoo Shing was the first residential development in Hong Kong to integrate landscaping into the design in 1975. The Albany, built in 1989, is one of the first examples of sky gardens and podium gardens in Hong Kong. In The Orchards, the residential towers are positioned to optimise open spaces and views, allowing natural daylight to enter apartments while preventing excessive heat gain from the sun. Further details of environmental design features in The Orchards are provided in Case Study No. 3.

EHS Aspects during Site Planning, Building Design and Construction

- Land-take and Landuse
- Building Orientation and Microclimate
- Indoor Environmental Quality
- Building Accessibility
- Cultural and Historical Preservation and Adaptation
- Materials Selection, Management and Consumption
- Chemicals Selection, Management and Consumption
- Water and Energy Consumption and Efficiency
- Air and Noise Emissions
- Environmental Hygiene
- Waste Management
- Wastewater Management
- Landscaping and Aesthetics
- Ecological Conservation
- Fire and Electrical Safety
- Mechanical Plant Safety
- Traffic Safety
- Occupational Risks
- Staff Competence and Training



We adopt similar principles in the design of our commercial buildings. Three Pacific Place is one of the first buildings in Hong Kong to use an innovative clear façade that allows increased levels of natural daylight inside the building, providing both a pleasant indoor environment and also reducing dependence on electrical lighting. A special coating on the double-glazed curtain wall and fins blocks heat from the sun, reducing the need for air-conditioning and thus saving energy.

Use of Building Materials

In our designs and contracts, we prefer to select low impact, resource-efficient and durable materials that:

- Have lower embodied energy and waste (over heavily processed products) e.g. clay tiles at 3 Coombe Road
- Contain recycled materials e.g. recycled rubber floor tiles at The Orchards
- Promote the reuse of salvaged materials e.g. refurbishing the original teak flooring rather than disposing of it in the Parkside renovation
- Do not unduly deplete limited natural resources e.g. using timber from sustainably managed sources
- Are produced as close to Hong Kong as possible to reduce transportation impacts e.g. use of pre-fabricated elements for The Orchards and Cambridge House

Clay tiles are a comparatively low environmental-impact material

Engineering Design and Technology

State-of-the-art engineering systems and technology are used to complement our building's architectural features in mitigating the potential environmental impacts of our developments. In particular energy efficiency is one of our key areas of concern.

Approximately 50% of energy use in buildings can be attributed to heating, cooling, ventilation and lighting according to the *Sustainable Buildings Technical Manual* published by the United States Green Building Council. In Hong Kong, this percentage could be as high as 70%.

Air-conditioning Systems. Most of our commercial buildings use water-cooled air-conditioning systems, which are inherently more efficient and quieter than the air-cooled alternatives. These systems are designed with:

- Maximum flexibility and efficiency; with separate controls for areas with different cooling requirements, to prevent the main system running unnecessarily
- Appropriately sized plant to match cooling demand
- High efficiency and variable speed motors for fans and pumps in place of 'on/off' motors or inlet guided vanes

Such features typically save 20% of the energy used by standard air-cooled plant and equipment. Case Study No. 5 provides an example of the benefits of water-cooled air-conditioning at Festival Walk.

The Orchards external sunshades

Three Pacific Place fins and façade

The Orchards balconies

Cambridge House provides our latest example of energy efficient building services; seawater-cooled, centrifugal chillers that also serve the air-conditioning system of nearby Devon House for more efficient cooling, thereby reducing the need for additional equipment. Like other buildings in our portfolio, Cambridge House incorporates numerous energy conservation systems such as heat wheels to recover energy from exhaust air in the summer. In Oxford House, a 'Free Cooling System' uses natural cool air instead of air-conditioning during colder months.

Lighting. Timers, motion detectors and photo sensors are used to regulate lighting in many of our buildings. These devices, which are used in outdoor and public areas such as lift lobbies, control the operation of lamps according to need, thereby preventing waste of energy when areas are unoccupied. In commercial buildings we specify the latest and most efficient lamps, such as compact fluorescent or T5 tubes, powered by energy efficient and high frequency electronic ballasts. In addition to saving energy, this also creates a more pleasant and productive working environment. In The Orchards, solar powered fittings, using the sun's renewable energy, are also used for decorative landscape lighting (see Case Study No. 3).

T5 fluorescent tubes installed at Cambridge House

Monitoring and Management. Metering and monitoring is fundamental to both measuring the effectiveness of the energy saving initiatives, and controlling the energy used by air-conditioning, lighting, lifts, plumbing, fire services and other equipment throughout each buildings' operational lifetime. These monitoring systems are also essential in facilitating demand side management (see next section) to further reduce energy consumption by switching off air-conditioning, lighting and lifts when not needed.

Construction Wastewater, Air and Noise Pollution Control

We aim to be an industry leader in constructing buildings with minimal environmental impacts using the latest construction methods and technologies.

The majority of our sites have wastewater treatment facilities to prevent the discharge of polluting wastewater from site. Wastewater is also recycled to reduce water consumption (see Case Study No. 2).

Noise emitted during construction is controlled through the use of quieter equipment, noise barriers and careful scheduling of operations. Where possible, noise reductions are achieved through innovative technology such as concrete crushers as illustrated in Case Study No. 1.

Air pollution (dust) control is ensured by the careful management of materials on site, using screens and dustsheets to cover material stockpiles, using water sprays to suppress dust and specially designed dust suppression chambers.

Environmental Mitigation Measures during Construction

Daily wastewater sampling at The Orchards construction site

Specially designed hoarding for minimising noise impact at Three Pacific Place

Dust suppression chamber at Three Pacific Place

Overhead nozzles for dust suppression at Cambridge House

Construction Waste Management

As a responsible corporate citizen, we have taken significant steps to reduce our construction waste according to three core principles: waste avoidance, recovery, and recycling. Specifically, we require our main contractors to develop and implement a Waste Management Plan that adopts these core principles.

Most buildings in Hong Kong are traditionally built 'in-situ', which involves transporting large quantities of raw building materials (sand, cement and iron reinforcement bars etc.) to site for on-site processing. This approach creates excessive waste as:

- Materials are often damaged or spoiled during their storage and use
- Formwork needs to be shaped to form the many different building elements
- Components (such as ductwork and ventilation systems) need to be cut down to size for installation

According to the Hong Kong Environmental Protection Department, landfill space in Hong Kong is being used at an alarming rate. The local property development and construction industry is responsible for approximately half of the waste currently disposed of to landfill as a result of construction and demolition works.

In addition, noise, dust, water pollution and transportation problems arise as a result of in-situ works, causing significant nuisance to local residents.

Waste sorting for recovery during construction at The Orchards

Waste Avoidance. We advocate the use of pre-fabricated elements manufactured off-site as this reduces cut-offs and excess concrete which will be produced as waste. In addition, quality and environmental emissions can be better controlled. Examples of pre-cast or pre-fabricated elements are the building façade, staircases, floor slabs, windows, ventilation ductwork and electrical & mechanical components. Where construction is in-situ, our policy is to maximise the use of re-usable formwork such as steel or aluminum in place of timber that would be disposed of in landfill. These practices have additional benefits, including a cleaner site and a shorter works programme.

Waste Recovery and Recycling. Waste recycling and reuse is achieved principally through initial waste separation and materials recovery on-site. The confined nature of some of our sites and lack of space for waste sorting is a constant challenge. Case Study No.1 illustrates how we addressed this issue at two of our demolition sites and consequently reduced our waste disposed of in landfill for both projects.

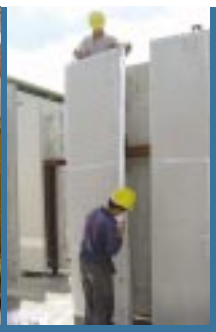
Working with our Contractors

Our construction contracts require our contractors to prepare and implement an Environmental Management Plan (EMP). This ensures that our contractors not only comply with legislation, but also identify and understand the environmental impacts of their work, and implement appropriate mitigation measures e.g. minimise pollution and disturbance to the local community. The implementation of EMPs on all our contracts is monitored through regular site audits. Our contractors also prepare and implement their Waste Management Plan in the same manner.

Requirements of the EMP include:

- An Environmental Policy Statement
- Statutory and Contract Obligations
- Mitigation and Preventive Measures
- Contractor's Organisation
- Communications
- Promotion of Environmental Awareness
- Documents and Records
- Environmental Procedures
- Periodic Monitoring and Auditing Requirements

Pre-cast façade



Lost formwork wall panels

Using Pre-cast Elements

60% of The Orchards' building elements (façade panels, staircases, balconies and cladding) were pre-cast off-site. Although material costs marginally increased, on-site work and thus noise, air pollution, waste and wastewater generated were significantly reduced, culminating in a site adopting traditional on-site construction methods, The Orchards' site consumed 41% less water and generated 56% less waste. The construction cycle was shortened by 20% and manpower reduced by 9.5%.

Health & Safety Issues

During the process of developing properties, we address the occupational health & safety of personnel involved in the construction works, as well as tenants, residents and the community during their occupation and patronage of our properties. Consequently, in each phase of the process, health & safety is an integral component of our decision making process.

Design for Safer Buildings

Safety is a key consideration in the design of our buildings such that our design guidelines require systematic and thorough consideration of building and engineering system safety including reliability and maintenance requirements.

Our teams include building managers, maintenance staff, consultants and construction advisors, who work together throughout the design process to prevent potentially unsafe conditions arising due to structural or system failure, procedural errors or misuse by workers, users and occupants.

Design for a Healthy Indoor Environment

Many of our stakeholders have a heightened awareness of the adverse health effects of a poor indoor environment, particularly in relation to indoor air quality (IAQ). We ensure good IAQ through our design initiatives. Examples are outlined below:

Ventilation Design. Fresh air intakes and exhaust points are strategically located, e.g. at Cambridge House, they are located on the building and podium roofs, with a separation distance sufficient to avoid the flow of exhausts back into air intakes. The lowest exhaust discharge points are also positioned at a height sufficiently above street level to prevent nuisance to the local community. Requirements for maintaining and cleaning the air-conditioning and ventilation systems, such as ventilation rate and filter selection, are designed to ensure high performance and safe functioning of these systems during the life span of the buildings. In recently completed buildings, we use electrostatic filters to filter incoming fresh air to improve IAQ.

We ensure that the configuration of new buildings' air-circulation and conditioning systems is both designed and operated to standards that meet the Hong Kong Building Environmental Assessment Method (HK-BEAM).

IAQ can be adversely affected by inadequate ventilation, chemical contamination from indoor and outdoor sources (e.g. building materials emitting hazardous gases, poor plumbing vents) and biological contamination such as bacteria and viruses.

The World Health Organisation suggests that up to 30% of new and renovated buildings worldwide have inadequate indoor air quality.

Building Materials Selection

In sourcing building materials, we avoid the use of materials that are made from, contain or emit toxic or hazardous substances. We research the use of safer substitutes or alternatives. Materials producing off-gas pollutants by releasing formaldehyde and volatile organic compounds (VOCs) are avoided e.g. at Cambridge House we have avoided the use of particleboard, plywood fittings and other pressed wood products. In the construction of our buildings, we encourage our contractors to use lead-free paints and conform with the relevant industrial standards governing VOC emissions.

Safety Features Incorporated at Design Stage

In Three Pacific Place, an extensive safety review was carried out to ensure safety during cleaning and maintenance procedures for the entire building especially skylights, façades and bridges and high atrium spaces. As a result, many safety features such as fall arrest systems, permanent catwalks and cherry pickers/mobile hydraulic platforms were designed as an integral part of the building. Operating and emergency procedures for gondolas were carefully researched to suit specific conditions e.g. over roads, to ensure appropriate and safe interfaces.

Certain building materials pose health risks through passive release of harmful gaseous substances into the indoor environment e.g. particleboard, fibreboard, plywood wall fittings or other pressed wood decorative products emit formaldehyde, a hazardous VOC that causes eye and throat irritation.

Health & Safety in Demolition and Construction

Depending on project size, during peak construction there may be up to 1,000 people (our staff and contractors) working on site at any one time, and engaged in a range of construction activities, each with a different level of inherent risk. We assign a high level of importance to the health & safety of both personnel working on our development sites and those in the vicinity of the sites.

Construction and demolition works involve the mobilisation of large heavy plant, machinery and materials, with personnel often working at heights, in confined spaces and open to the elements, thus exposing workers to relatively high occupational risk.

To minimise and control these risks, we select well-managed, experienced and committed contractors with a good track record in safety performance and the use of safer working methods and techniques.

Designated Safety Personnel On Site. Our contractors are required to appoint a safety officer to oversee all safety matters. For larger sites, a fire safety manager is also mandatory to identify and implement fire precautionary measures and fire safety plans.

Our resident site team, typically consisting of an architect or clerk-of-works, a building services engineer and a structural engineer, is responsible for approving and checking technical plans and submissions by our contractors, including safety issues. By conducting regular inspections, the team also ensures activities are carried out in a safe manner and a proper safety management mechanism is implemented. Project safety meetings are held with our contractors to review safety performance and to resolve any safety issues. Contractors are also required to submit bi-weekly safety reports and promptly report any incidents, accidents and follow up to our project managers.

We have a zero tolerance policy for alcohol, drugs and other substances, which may impair judgement on our sites. Any person on site found to be under the influence of such substances will be immediately removed and will not be employed again on the project.

Safer Demolition and Construction Methods. Our research into innovative construction methods facilitates the use of safer state-of-the-art mobile plant and safety equipment. In our recent demolition projects (see Case Study No. 1), the use of innovative technology also provided safety benefits in addition to the main environmental benefits. There were no accidents during the demolition at Westlands Road and Wing Fung Street.

In our recent construction projects including The Orchards and Cambridge House (see Case Studies Nos. 2 and 3), the practice of pre-fabrication and pre-casting large concrete building elements off-site significantly reduced the potential for accidents and injuries. This was largely due to the elimination of concreting operations on site, involving the use of large mechanical plant and equipment.

Examples of Safety Features and Practices on Construction Sites

Temporary gantry for hoisting

Jump lift for vertical transportation

External reusable floor edge protection fencing

Safety barrier for pedestrian flow control at site entrance

Workers undertaking pre-work stretching exercises

The reportable accident rates at The Orchards and Cambridge House during 2003 are 47.0 and 32.5 per 1000 workers respectively, with both rates being significantly lower than the Hong Kong Construction Industry (HKCI) average of 64.6 for the year (see chart). In particular, The Orchards' accident rate during its entire 22-month construction period (from August 2001 to May 2003) was kept to 30.0 per 1000 workers.

'Pay-for-Safety' Scheme. We are one of the few private sector developers in Hong Kong to adopt the Pay-for-Safety Scheme. Implemented since 1999, the scheme requires all construction tenderers to account for all necessary safety items that satisfy our safety requirements in their tenders. This way, occupational health & safety during construction cannot be compromised by cost-cutting bids. Contractors will only be compensated for the satisfactory performance of the safety plan and its associated management issues.

Examples of Site Safety Practices

- Daily Morning Assembly
- Hazard Identification
- Prior-to-work Inspection
- Daily Site Walk
- Weekly Site Safety Inspection
- Training
- Emergency Preparedness
- Prevention of Falling Objects and Fall of Person e.g.
  - Floor Edge Fencing
  - Catch Fan
  - Metal Scaffold
  - Provision of Protective Nets
- Load Shifting Machinery e.g. Jump Lift
- Stretching Exercises before Work

Key 2003 Indicators

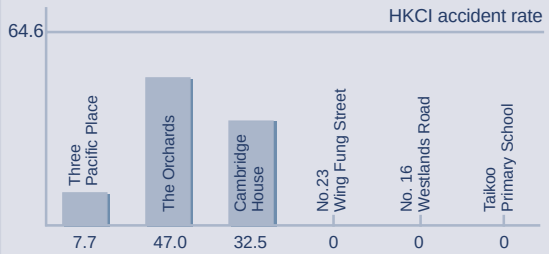
- SPL site staff fatalities = 0
- SPL site staff no. of accidents = 0
- SPL site staff reportable accident rate = 0
- SPL site staff loss time = 0
- Contractor's fatalities on Swire Properties sites* = 0
- Contractor's no. of accidents on Swire Properties sites* = 22
- Contractor's H&S compliance = 1 prosecution by the Labour Department with regard to lack of safety prevention against falling from height (for Westlands Road)

*including a total of 6 sites respectively at No. 23 Wing Fung Street, No. 16 Westlands Road, Three Pacific Place, The Orchards, Taikoo Shing Community Centre and Cambridge House.

Contractor's Reportable Accident Causes (i.e. types of injuries) include:

- Laceration and cut
- Concussion
- Machinery and plant
- Sprain and strain
- Fracture
- Striking against / struck by objects

Contractor's Reportable Accident Rate in 2003 (per 1000 Workers)**



**Accident rate per 1000 workers is calculated by the formula 'no. of accidents x 1000 total mandays / (no. of months x 25 days)'

Environmental Certification of Property Developments

Our efforts in environmental protection have been recognised through voluntary and independent certification against HK-BEAM, the Hong Kong Building Environmental Assessment Method. HK-BEAM is a private sector initiative that sets best practice criteria for a range of environmental issues in the planning, design, construction and commissioning of new building developments – standards that go beyond legal requirements and industry norms. We have worked closely with our project teams to satisfy the requirements of HK-BEAM with the following achievements:

Name of Development	Type	Rating	Date
Lincoln House	Office	Excellent	1998
One Pacific Place	Office	Excellent	1999
Devon House	Office	Excellent	1999
Oxford House	Office	Excellent	1999
Dorset House	Office	Excellent	2000
Cityplaza One	Office	Excellent	2002
Les Saisons	Residential	Very Good	2002
Cambridge House	Office	Excellent	2003
The Orchards	Residential	Excellent	2003